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III

THE MARINE MIOCENE DEPOSITS OF NORTH COLOMBIA

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This paper is offered as a preliminary note on the Miocene section of northern Colombia, concerning which a more complete discussion will be furnished later. The section is the somewhat incomplete series occurring near Puerto Colombia at Tubera Mountain, Usiacuri, and neighboring points.

Its aggregate thickness at Tubera Mountain is near 2800 feet, which has been divided into a number of horizons, or stages, some of which are fossiliferous. In the following tabular outline they are designated by letter:

T,—Top of section, not locally represented.....	2,650	feet
S,—Soft, medium-grained sandstone at the top of Tubera Mountain	450	"
R,—Soft yellowish sandstone at Tubera village, containing numerous fossil Mollusca.....	350	"
Q,—Sandstones and shales.....	350	"
P,—Fossiliferous gray, sandy shale, northwest slope of Tubera Mountain	400	"
O,—Sandy shales and soft incoherent sandstone with feruginous layers	400	"
N,—Gravelly sandstone, hard in part, with species of Turritella, Spondylus, and other forms.....	550	"
M,—Blue or gray shales..... 50 feet soft shaly sandstone, and pebbly beds, conglomerate, etc..... 250 "	300	"
Total,	2800	feet

The most fossiliferous stage is "M", of which a brief account will be given here on account of its special position and faunal character.

Beneath "Stage M" there are clay shales, sandy shales and hard cherty beds occurring near Las Perdices and other points, the thickness of which is not known beyond a few hundred feet. It contains a few species of Mollusca, bone fragments and scales of fishes, sponge spicules and numerous species of Foraminifera.

Dr. G. Dallas Hanna has made a preliminary examination of these shales and has offered the following notes:

"The shales contain a very considerable number of fossils, the groups being represented about as follows in order of abundance: (1) Radiolaria; (2) Diatomaceæ; (3) Foraminifera; (4) Sponges; other organisms are scarce. There has been pyritization to a considerable extent and many of the chambers of the fossils are filled with iron sulphide. A great many of the diatoms have been replaced entirely and internal casts of the frustules are abundant. *Coscinodiscus* was the only genus definitely identified in this group. Many of the genera and some of the species of Radiolaria are the same as have been found in the famous deposit on Barbados Island[1] and which Payne[2] has put definitely in the Miocene. Some of the genera are: *Stylodictya, Histiastrum, Stylosphæra* and *Eucyrtidium*. Foraminifera are scattered rather sparingly through the mass of the material, the common genera being: *Globigerina, Orbulina, Lagena, Truncatulina, Cassidulina, Nodosaria, Anomalina, Frondicularia, Plectofrondicularia* and *Bolovina*. It is believed that these organisms offer a means whereby a definite correlation can be made with strata of known age elsewhere. This preliminary examination indicates that the formation lies very close to the base of the Miocene, if, in fact, it is not the lowermost part of the sediments of that period."

"Stage M" is in part a coarse pebbly sandstone, often forming conglomerate near the base, and quite fossiliferous, including many heavy-shelled species and littoral forms not found higher up in the section. Some of the slaty pebbles at the base have been perforated by boring molluscan species, which fact, taken together with the character of the fauna itself, shows this horizon to have been deposited near shore, and the character of the pebbles indicates that the shore formations were such as have been described for underlying rocks.

[1] See Ehrenberg, Fortsetzung der mikrogeologischen Studien als Gesammt-Uebersicht der Mikroskopischen Paläontologie gleichartig analysirter Gebirgsarten der Erde, mit specieller Rücksicht auf den Polycystinen-Mergel bei Barbados. Abhand. k. Akad. Wissensch. Berlin, 1875 (1876), pp. 1-226, pls. 1-30.

[2] Liostephania and its allies. London, 1922, p. 21.

From the foregoing statements it would appear that "Stage M" rests unconformably upon these formations, but as to whether the latter group may not also be a part of the Miocene series has not hitherto been known. "Stage M" is believed to be older than any other similar group of the Miocene in Colombia, and since it is found at Punta Pua east of Cartagena, and at other places still more distant, its occurrence is not local, and its fauna is characteristically littoral, as already stated.

This stage is undoubtedly older than the Gatun group as found at the spillway of the Canal, though probably not older than some of the beds placed in the Gatun group by other writers. In Costa Rica Olsson has described Miocene beds thought to belong to the Gatun group, but older than those occurring near Gatun. They may be contemporaneous with "Stage M" of the Colombian section, and if so, both should also be correlated with the Cercado stage of Santo Domingo (Maury), which is probably older than the Gatun group of the Canal Zone.

Some of the more characteristic species from "Stage M" are included in the following list:

Antigona caribbeana n. sp.
Arca veatchi Olsson
Arca rel. *chiriquiensis* Gabb
Arca (Scapharca) auriculata Lam.
Cardium (Trachycard.) lingualeonis Guppy
Cardium (Laevicard.) dalli Toula
Glycymeris jamaicensis Dall
Glycymeris lloydsmithi Brown & Pilsbry
Mactrella (Harvella) elegans Sow.
Pitaria cercadica Maury
Raeta gibbosa Gabb
Spondylus bostrychites Guppy
Spondylus cf. *gumanomocon* Brown & Pilsbry
Venericardia brassica (Maury)
Cypraea henekeni Sowerby
Conus molis Brown & Pilsbry
Architectonica gatunensis Toula
Natica cuspidata Guppy
Natica guppyana Toula
Mitra henekeni Sowerby
Strombus pugiloides Guppy
Strombus gatunensis Toula
Terebra rel. *haitensis* Dall
Terebra bipartita Sowerby
Terebra gatunensis Toula
[3]*Turritella abrupta* (Spieker)
Turritella altilirata Conrad
Turritella planigyrata Guppy
Petaloconchus domingensis Sowerby
Serpulorbis papulosa Guppy
Carcharodon cf. *rectus* Agassiz

[3] Spieker has described as a variety of *T. robusta* Grzy. a form which he calls var. *abrupta* from the Zorritos formation of Peru. (See Johns Hopkins University Studies in Geology, No. 3, 1922, p. 85, Pl. IV, fig. 6.) The Colombian species is probably identical with this, which can be distinguished from *T. robusta* Grzy., not Gabb (=*T. supraconcava* Hanna & Israelsky, 1925).

The description of only a single species thus far found in "Stage M" can be offered to illustrate its fauna at the present time, though its full stratigraphic range is not yet known.

Antigona caribbeana Anderson, new species

Antigona multicostata OLSSON (not SOWERBY), Bull. Am. Pal. Vol. IX, p. 411, Pl. 30, fig. 1; Gatun stage, Water Cay; Lower Miocene of Costa Rica.

This immense species of Antigona is perhaps the largest representative of the genus yet found in the Caribbean Tertiary deposits. The holotype here figured measures 6.75 inches in length, 6.25 inches in altitude, 4.75 inches in entire thickness; weight of a nearly complete well-cleaned shell, 4.6 pounds. Shell cordate in outline, when full grown, though younger individuals in the collection are somewhat quadrate, as shown in Olsson's figure; umbones prominent, though depressed, drooping forward; dorsal margin roundly curved from beak to posterior end in the holotype, though younger shells somewhat angulated at the rear; anterior dorsal margin narrowly rounded; ventral margin nearly circular, or a little straightened behind; lunule relatively small, impressed, bordered by a sharp groove, flattened though rugose throughout by concentric lines of growth; escutcheon deep and wide, bordered by a pronounced ridge, from which, on the left valve, the slope is much broadened, overlapped only at the rear; ligamental groove deep and wide; hinge plate short, as shown in the figure, and relatively heavy as compared with its near relative, *Antigona multicostata* (Sowerby); inner margin of the shell finely crenulated, in which respect it differs from the latter species; muscle scars large, anterior deeply impressed; surface of shell concentrically costate with about 46 strong but almost smooth, flattened concentric ridges, slightly nodose on the anterior end of the shell.

Type: No. 2521, Mus. Calif. Acad. Sci. from **Tubera Mountain near Puerto Colombia, Colombia**; Miocene.

This species is doubtless a near relative of the smaller living and Pleistocene form described by Sowerby as *Venus multi-*

costata from the Panama region,[4] which has not yet been shown to occur in the Miocene deposits. Possibly another near relative is found in the smaller *Venus ducatelli* Conrad from the Miocene of Maryland. Our species differs from the living *V. multicostata* in being larger, and relatively heavier, with shorter and heavier hinge plate and teeth, and in being ornamented on the surface by smoother, less nodose concentric costae, and within by crenulations along the ventral margin of the shell, which the living species lacks. It differs from *V. ducatelli* in being much larger and heavier, with more prominent umbones, relatively heavier hinge, and crenulated interior margin.

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[4] Proc. Zool. Soc. Lond. 1835, p. 22.

Plate 2

Antigona caribbeana Anderson, new species. Type No. 2521 (Mus. Calif. Acad. Sci.) from **Tubera Mountain,** near **Puerto Colombia, Colombia;** natural size.

Plate 3

Antigona caribbeana Anderson, new species. Type No. 2521 (Mus. Calif Acad. Sci.) from **Tubera Mountain**, near **Puerto Colombia, Colombia**; natural size.